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DOI:

[10.4018/IJVPLE.2019010103](https://doi.org/10.4018/IJVPLE.2019010103)

Document Version

Peer reviewed version

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Citation for published version (APA):

Dommett, E. J. (2019). Understanding the use of online tools embedded within a virtual learning environment. *The Journal of neuropsychiatry and clinical neurosciences*, 9(1), 39-55.
<https://doi.org/10.4018/IJVPLE.2019010103>

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Understanding the use of online tools embedded within a virtual learning environment

Eleanor J. Dommett

Abstract

Different learning tools are available within virtual learning environments, including forums, quizzes and ePortfolios. This study investigates perceptions of helpfulness and ease of use of these three tools, including how they are impacted by learner characteristics and what predicts frequency of use of each tool. Critically, the relationship between perceived helpfulness of the three tools and their ability to support achievement of learning outcomes and development of employability skills is assessed. The findings support previous work showing an impact of learner characteristics on perceived helpfulness and ease of use for all tools. Results also show that the ability of forums to support achievement of learning outcomes predicts their perceived helpfulness, whilst development of employability skills predicts helpfulness of quizzes. In turn, helpfulness but not ease of use predicted frequency of these tools.

Keywords

ePortfolio; quiz; forums; learning outcomes; employability

Introduction

Online learning offers several advantages over face-to-face learning including easier ways of providing feedback (Collis, De Boer, & Slotman, 2001), flexibility in the pace of learning (Sherman, 1998; Ward & Newlands, 1998), greater anonymity for learners (Howe, 1998), opportunities to develop generic skills (Oliver & McLoughlin, 2001) and reaching and motivating a large and diverse audience (Hoskins & Van Hooff, 2005; Plous, 2000). In universities, most online learning takes place via institutional virtual learning environments (VLEs), which can include a variety of features. Several studies have considered the what makes effective online learning and noted the value of i) dialogue e.g. forums ii) structured

tasks and activities e.g. quizzes, and iii) learner control over activities e.g. through ePortfolios (Blackburn & Hakel, 2006; Buchem, 2012; Coomey & Stephenson, 2001). However, even with carefully chosen tools and the general benefits of online learning, there are various factors which are likely to impact how learners perceive and engage with online tools including the quality of the tools (Chang & Tung, 2008).

Davis suggested the Technology Acceptance Model (TAM) (Davis, 1989); based on this model, learners will use an online learning tool more when they see it as useful and easy to navigate (Joo, Lim, & Kim, 2011). Both factors may be influenced by the characteristics of the learner. For example, research shows that men find it harder than women to interact online (Arbaugh et al., 2008) and are less inclined to join discussions (Jackson, Ervin, Gardner, & Schmitt, 2001) despite having more knowledge of the web and using it more often (Chmielewski, 1998). In terms of age, little is known about the typical university age group, although one study suggests learners over 21 years engage more with online tools than those under 21 years of age (Hoskins & Van Hooff, 2005). The same study found that higher achieving learners were more likely to engage in forum use but there were no differences for quizzes. There is also evidence to suggest that learners with disabilities may experience additional challenges in accessing online tools (Crow, 2008).

One factor that is likely to influence the perception of how useful an online learning tool is to the learner is the relationship between the tool and the achievement of learning outcomes (LOs). The use of sophisticated online tools can go beyond participative learning to allow learners to construct knowledge using the tools (Cych, 2006; Heppell, 2002; Oliver & Goerke, 2007). This has been found for forums (Hew & Cheung, 2011; Kanuka & Anderson, 2007), ePortfolios (Carmean & Christie, 2006; Granberg, 2010) and quizzes (Gold, 2001) i.e. all tools frequently available within institutional VLEs. Furthermore, engagement with such tools has been linked to improved performance (Hoskins & Van Hooff, 2005).

As well as utility in achieving specific learning outcomes, it is possible that online tools support employability and may be perceived as useful because of this. Employability can be crudely defined as one's ability to get a job or progress within an existing job (Delaney & Farren, 2016). However, it is often considered as a specific skill set including core skills in Problem Solving, Communication, Working With Others, Time Management, Planning and Organizing and Finding and Using Information (Mason, Williams, & Cranmer, 2009; National Committee of Inquiry into Higher Education, 1997). These skills have become increasingly important within Higher Education which has resulted in universities making a concerted effort to support their development. Employability skills have also gained traction with learners; research shows learners are motivated by their long-term employability (Delaney & Farren, 2016) and that they recognise the value of developing these skills (Jackson, 2013; Moreau & Leathwood, 2006; Tomlinson, 2008; Tymon, 2013). Furthermore, there is evidence to suggest that use of online tools within a VLE can support development of employability skills (Heinssen Jr, Glass, & Knight, 1987; Hoskins & Van Hooff, 2005; Leese, 2009; Miura, 1987; Oliver & McLoughlin, 2001).

Based on the research outlined here, this investigation tested three hypotheses: a) The usefulness of online tools would vary with individual characteristics of learners, their perceptions of the quality of their online learning experiences and how helpful individual tools are perceived to be in supporting the development learning outcomes and employability skills b) Ease of use would also be impacted by individual learner characteristics and c) Perceived usefulness and ease of use would predict frequency of use in line with the TAM. For all hypotheses, three online tools available within the institutional VLE were examined: forums, quizzes and ePortfolios. This allowed comparisons between the tools for ease of use, usefulness and frequency of use. Table 1 provides details of features enabled in the VLE for these tools and an example of typical use at the institution.

Table 1 Features and typical use of the three online learning tools being examined at the institution where the research took place.

<i>Tool</i>	<i>Features</i>	<i>Example Use</i>
<i>Forum</i>	Supports asynchronous discussion with learners posting and responding to each other and teachers. There is an option to include attachments and learners are generally enrolled for subscriptions (although they may opt-out in some cases). There is a 30 minute editing period before message is made visible.	This is a standard tool, automatically added to course pages. Typically used in a semi-structured manner e.g. forum for each module with threads set up for key topics.
<i>Quiz</i>	Quizzes can be used with a range of question types (multiple choice, numerical, drag and drop, ordering) and different levels and periods of feedback (immediate vs deferred).	Typically used for formative self-assessment during a course but may be used for summative assessment in some cases.
<i>ePortfolio</i>	The ePortfolio service allows users to create and share a personalised space. All ePortfolios contain a basic profile page and allow links to social media accounts. Additional pages available for the user to select include journal/blog pages, resumé, to-do lists and notes pages. Files and folders can be added. Commenting can be enabled and the portfolio may be exported.	Typically used for reflective practice or to evidence work-based/placement experience. In both cases they may be assessed.

Method

In line with the host institution's research requirements, all procedures were approved by the Institutional Research Ethics Subcommittee in advance of data collection. This project was approved under the 'Minimal Risk' category (as opposed to Low or High Risk) following committee review of a project outline including details of participant population, recruitment methods, proposed measurements and identification of any risks or benefits to the research.

Participants and procedure

Eligible participants i.e., full-time undergraduates or taught postgraduates at a U.K. university, aged 18 years or over completed an online survey. Recruitment was via email circulars at the host institution and the institutional VLE landing page. Consenting participants accessed an

online survey, which took 30 minutes to complete. Those who completed the survey were offered entry into a prize draw to win a £50 amazon voucher. Two-hundred and twenty-two participants accessed the survey, of which 166 completed it (75% completion rate) with all faculties of the university represented in the final sample.

Measures

The survey consisted of two sections: ‘Learner and Study Characteristics’ and ‘Usefulness and Ease of Use’.

Learner and Study Characteristics: Learners provided basic demographic characteristics (Gender, Age) as well as whether English was their first language and whether they were disabled. These data were collected to examine whether the sample was representative of the university population and whether these characteristics impacted on use of online tools as suggested previously (Arbaugh et al., 2008; Chmielewski, 1998; Crow, 2008; Hoskins & Van Hooff, 2005; Jackson et al., 2001). For study characteristics, learners were asked to identify their faculty and level of study (undergraduate or postgraduate). They were also asked to estimate their weekly number of contact hours and independent study hours (1-8, 9-16, 17-24, 25-32, 33-40 hours) and their performance based on either, previous semester grades, or their most recent assessment (<40, 40-49, 50-59, 60-69, 70+%). Again, this information served a dual purpose of validating the representativeness of the sample and investigating whether these features of study impacted on use of online tools (Hoskins & Van Hooff, 2005). Finally, learners were asked to indicate the frequency of their use on a scale from ‘Never’ (1) to ‘Always’ (5) for the three online tools.

Usefulness and Ease of Use: To assess how useful the learners saw the three online tools, they answered a series of questions for each of the tools they had previously used. Firstly, they were asked to indicate how helpful they felt each tool was in supporting their learning on a scale of

‘Not at all helpful’ (1) to ‘Extremely helpful’ (5). They were then asked to rate the quality of their face-to-face and their online learning experience on a scale of ‘Very Poor’ (1) to ‘Very good’ (5). To ascertain whether learners perceived specific online tools as helpful in achieving certain types of learning outcome, they were provided with definitions of four categories of learning outcome: Knowledge and Understanding (KU- learning outcomes normally requiring learners to demonstrate or explain knowledge of key concepts or theories), Cognitive Skills (CS Cognitive skills – learning outcomes normally requiring learners to demonstrate particular abilities, for example, using data or recognizing limitations of a particular approach), Key Skills (KS, learning outcomes normally relating to study skills such as locating information online or communication skills), Professional and Practical Skills (PPS, learning outcomes relating to professional practice in some way, for example, for a scientist, this may be designing and conducting an experiment). They were then asked to indicate the extent to which they felt each of the tools they had used was effective at supporting each type of learning outcome on a scale of ‘Extremely Effective’ (1) to ‘Not At All Effective’ (5). This scale was reverse scored. A similar approach was taken for specific employability measures with learners asked to rate the extent to which they felt each online tool helped them develop key employability skills (Problem Solving, Communication, Working With Others, Time Management, Planning and Organizing and Finding and Using Information) on a scale of ‘Extremely Unhelpful’ (1) to ‘Extremely Helpful’ (7). Finally, learners were also asked to indicate the Ease of Use of each tool on a scale of ‘Extremely difficult’ (1) to ‘Extremely Easy’ (7).

Data Analysis

Hypothesis 1 was tested using several statistical tests. Firstly, independent sample t-tests were used to identify significant differences in general helpfulness ratings between groups of learners (men ~ women, with ~ without English as a first language; disability ~ no disability and undergraduate ~ postgraduate). Pearson bivariate correlations were used to examine

relationships between helpfulness ratings and age, contact hours, independent study hours, estimated performance and quality of online and face-to-face learning experiences. Learning outcomes and employability measures for each tool were subjected to an exploratory factor analysis with direct oblimin rotation. Factors with eigenvalues over one were then used in a linear regression with helpfulness as the dependent variable to investigate whether the ability of the tool to support employability skills or learning outcomes predicted perceived helpfulness.

In addition to this main testing of Hypothesis 1, a One-Way ANOVA was used to compare helpfulness scores of the three tools. Furthermore, a t-test was used to examine whether there was a significant difference between quality ratings for online and face-to-face learning experiences. Mixed-ANOVAs were then carried out to ascertain whether gender, disability, language or level of study impacted on learning experience quality in both modes. Pearson bivariate correlations were then used to look for relationships between age, contact hours, independent study hours, estimated performance and quality of online and face-to-face learning experiences. For both employability and learning outcomes mixed-measures ANOVAs were completed with the online tool as the between measures factor and the learning outcome or employability skill as the between measures factor to ascertain whether the tools differed in their abilities to support the specific learning outcomes or skills.

Hypothesis 2, relating to the ease of use of different online tools, was analysed in a similar way with use of independent sample t-tests and Pearson bivariate correlations. Additionally, to compare the different tools, a One-Way ANOVA was used. For Hypothesis 3, a linear regression was conducted for each tool with overall helpfulness and ease of use as predictors of frequency of use.

Results

Learner and Study Characteristics

The characteristics of the final sample i.e. all those who completed the survey are shown in Table 2.

Table 2 Characteristics of the final sample.

<i>Characteristic</i>	<i>Sample breakdown</i>
<i>Gender: Male: Female: Prefer not to say</i>	44: 120: 2
<i>English First Language: Yes: No</i>	111: 55
<i>Disability: No: YES: Prefer not to say</i>	149: 12: 5
<i>Age (mean \pm SEM)</i>	22 year 9 months \pm 4.4 months
<i>Qualification: UG: PG</i>	111:54

Most learners reported 9-16 hours of weekly contact time and similar amounts of independent study. In terms of performance, students studying for an undergraduate qualification showed 44.7% giving their performance as a first (i.e. more than 70%) and the same proportion reporting a 2.1, whilst 6.4% reporting a 2.2 classification and 2.1% reporting a third. A further 2.1% reported achieving less than 40%. This is in line with data collected by the Higher Education Statistics Agency (HESA), who collect data for all U.K. universities. Their data shows that 46.4% receive a 2.1, 10% receive a 2.2 and just 1.7% achieve a third. However, the proportion of high performing learners in the sample may be higher than in the wider population where HESA reports 29.5% receiving first class degrees. There is no postgraduate data to compare with but in the sample 37.8% reported achieving at 70% or higher (distinction), 46.9% at 60-69% (merit) and 11.2% at pass level and a further 4.1% at less than 50% which is normally the pass/fail boundary for taught postgraduate programmes. Of the three tools under investigation, the tool used with the highest frequency was forums (N=103), followed by

quizzes (N=98). Very few were using ePortfolios (N=45) with over 70% never having used this tool (Figure 1). Note that, as stated in the methods, ratings on usefulness and ease of use were only provided by students who had actually used the tools and it is therefore these sample sizes that were analysed.

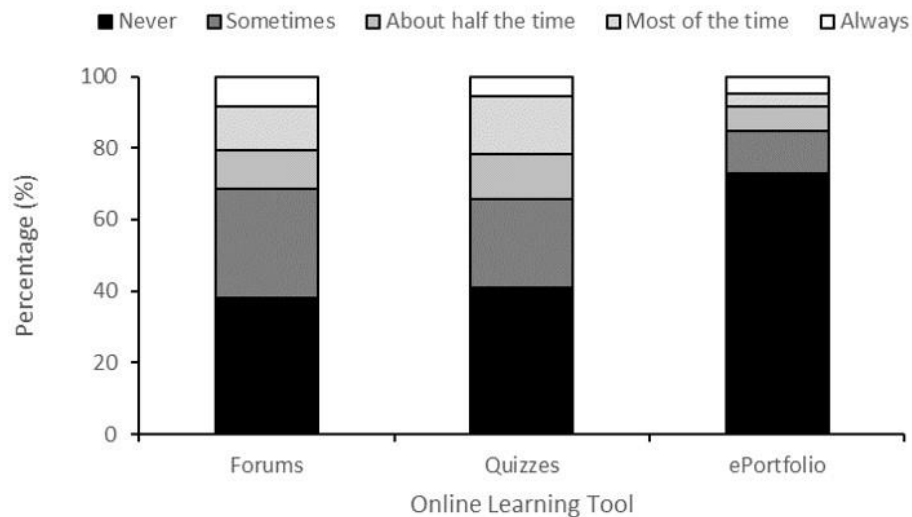


Figure 1 Reported frequency of use for three institutionally provided online tools.

Hypothesis 1: Usefulness of online tools

Usefulness of the different tools

A One-Way ANOVA showed no significant differences in the perceived helpfulness of the different tools in supporting their learning, although it is notable that none were deemed very helpful (Figure 2, $F(2, 247) = 2.55, p=0.08$).

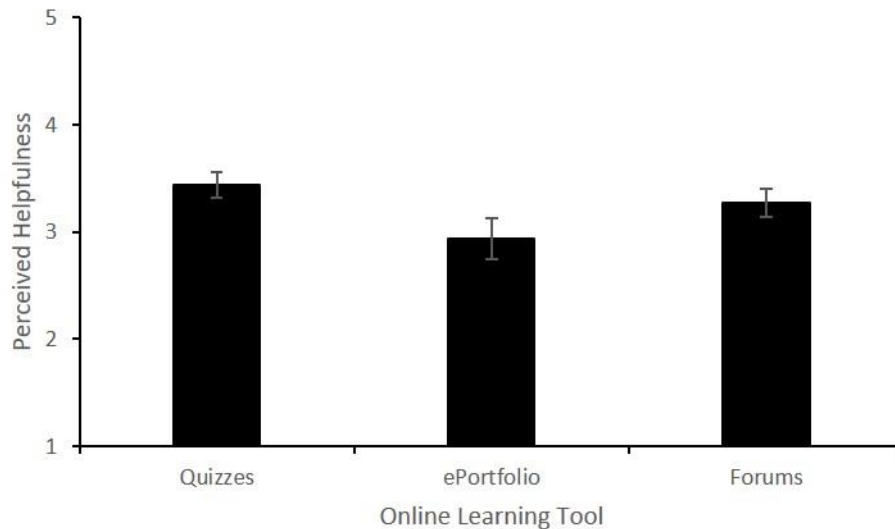


Figure 2 Perceived helpfulness ratings for the three tools ($M \pm SE$).

Individual learner characteristics

There were no significant differences in helpfulness ratings between men and women for forums ($t(94) = 1.48$, $p = 0.143$) and ePortfolio ($t(50) = 1.73$, $p = 0.089$). There were arguably trend level differences for quizzes ($t(95) = 1.97$, $p = 0.051$), with women ($M = 3.58$, $SE = 0.14$) finding them more helpful than men ($M = 3.07$, $SE = 0.24$). There were no significant differences in perceived helpfulness between learners with and without English as a first language for quizzes ($t(96) = 1.44$, $p = 0.152$) or ePortfolios ($t(51) = 1.27$, $p = 0.210$). However, there was a significant difference for forums ($t(95) = 2.02$, $p = 0.046$) with those learners with English as a first language ($M = 3.08$, $SE = 0.17$) seeing forums as less helpful than those without ($M = 3.64$, $SE = 0.21$). In terms of disability, there were no significant differences for forums ($t(91) = 0.03$, $p = 0.976$) or the ePortfolio ($t(49) = 1.60$, $p = 0.117$) tools but there was a significant difference between learners with and without a disability for quizzes ($t(94) = 2.32$, $p = 0.023$) with disabled learners ($M = 2.43$, $SE = 0.61$) finding them less helpful than learners without disability ($M = 3.51$, $SE = 0.12$). There were no significant differences according to level of study (forum $t(95) = 0.73$, $p = 0.469$; quizzes $t(96) = 0.21$, $p = 0.834$; ePortfolio $t(51) = 0.42$, $p = 0.675$). There were no

significant correlations between age, contact hours, independent study or performance for any of the tools (Table 3). However, the values of helpfulness between tools were strongly correlated.

*Table 3 Correlations between perceived helpfulness and the age of the learner and their study hours and estimated performance * $p < 0.05$, ** $p < 0.001$.*

	1	2	3	4	5	6
1. Quizzes	-					
2. ePortfolio	0.414**	-				
3. Forums	0.465**	0.674**	-			
4. Age	-0.162	-0.001	-0.077	-		
5. Contact hours	0.032	-0.231	-0.145	-0.207**	-	
6. Independent study hours	0.128	0.120	0.052	0.119	-0.070	
7. Performance	0.025	-0.090	-0.006	-0.126	0.169*	0.148

Quality of learning experience

Learner ratings of the quality of their face-to-face ($M=4.08$ $SE=0.06$) and online learning ($M=3.74$ $SE=0.06$) experiences revealed that the two were significantly correlated ($r=0.330$, $p < 0.001$) but the difference between the ratings for these two modes of learning was significant ($t(158)=4.62$, $p < 0.001$) when the whole cohort is considered with face-to-face learning viewed as a higher quality. Importantly for the present hypothesis, the reported ratings for the quality of online learning experiences significantly correlated with the perceived helpfulness of the tools for quizzes ($r=0.282$, $p=0.05$) and forums ($r=0.369$, $p < 0.001$) but not for ePortfolios ($r=0.203$, $p=0.145$). There were no significant correlations between helpfulness of tools and quality of face-to-face learning experiences (quizzes $r=0.079$, $p=0.442$; forums $r=0.19$, $p=0.063$; ePortfolios $r=0.129$, $p=0.268$), suggesting mode is important.

Mixed- ANOVAs were then carried out to determine whether certain learner characteristics impacted on the experiences both face-to-face and online. Analysis with GENDER as the between-subject variable and MODE (face-to-face vs online) as the within-subject variable showed a significant main effect of MODE as expected from the overall analysis ($F(1, 156)=20.29$, $p < 0.001$), with face-to-face rated more highly. But there was also a main effect

of GENDER ($F(1, 156)= 4.44, p=0.037$) with males reporting lower quality learning experience relative to females. There was no significant interaction ($F(1, 156)=0.81, p=0.370$) which indicates that males reported poorer learning experiences across both face-to-face and online learning (Figure 3).

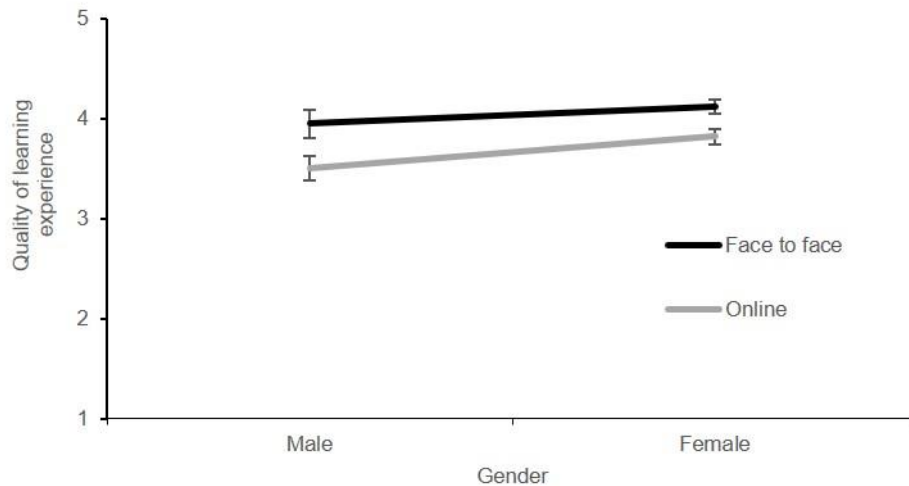


Figure 3 Male and female ratings for quality of learning experiences ($M \pm SE$).

A similar analysis with FIRST LANGUAGE as the between-subject factor found no significant main effect of language ($F(1, 157)=2.94, p=0.088$) and no significant interaction ($F(1, 157)=0.091, p=0.763$). The significant main effect of MODE remained ($F(1, 157)=17.80, p < 0.001$). Analysis considering DISABILITY as the between-subject variable found no significant main effect of disability ($F(1, 153)=1.76, p=0.186$) and no significant interaction between disability and mode ($F(1, 153)=1.46, p=0.229$). There was still a significant main effect of MODE ($F(1, 153)=12.00, p=0.001$). A final mixed- ANOVA was conducted with LEVEL OF STUDY (i.e. undergraduate or postgraduate) as the between-subject factor. This showed no significant main effect of the level of qualification ($F(1, 156)=1.858, p=0.175$) or interaction effect ($F(1, 156)=2.486, p=0.117$) but continued to show the significant main effect of MODE ($F(1, 156)=24.04, p < 0.001$). There were no significant correlations between the perceived quality

of either type of learning experience and age (Face-to-face $r=-0.072$, $p=0.370$; online $r=-0.078$, $p=0.326$), contact hours (Face-to-face $r=-0.095$, $p=0.232$; online $r=0.071$, $p=0.369$) or independent study hours (Face-to-face $r=0.054$, $p=0.495$ online $r=0.048$, $p=0.540$). There was a significant correlation between face-to-face experience and performance ($r=0.193$, $p=0.023$) but not online experiences ($r=0.115$, $p=0.172$).

Learning outcomes

Ratings of the perceived effectiveness of each of the online tools in supporting learners achieve different types of learning outcome is shown in Figure 4.

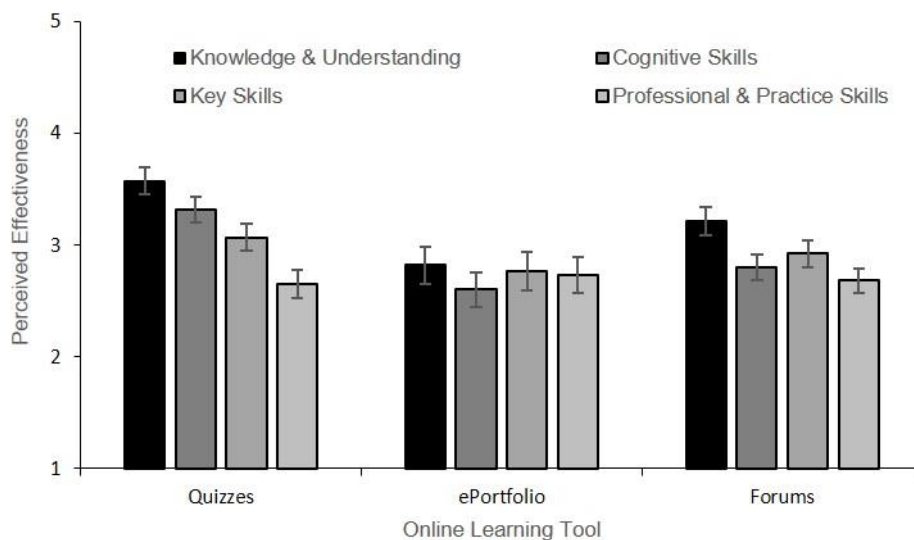


Figure 4 Learners provided ratings for how effectively different online tools supported attainment of four classes of learning outcomes ($M \pm SE$).

A mixed-ANOVA with TOOL as the between measures effect and LEARNING OUTCOME as the within-measures effect, found no significant effect of TOOL ($F(4, 414)=2.067$, $p=0.084$) but there was a significant main effect of Learning Outcome (Figure 5). Repeated measures t-tests with a Bonferroni corrected alpha of 0.0083 found that knowledge and understanding LOs were supported more than all others ($p < 0.001$). Additionally, cognitive skills ($p=0.001$) and key skills ($p < 0.001$) support was greater than in comparison to professional and practice skills.

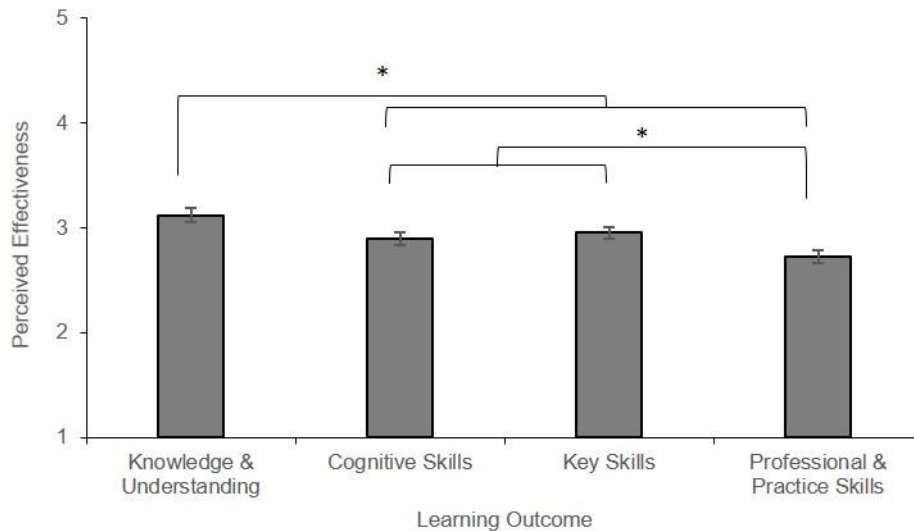


Figure 5 Perceived effectiveness in learning outcomes across all tools varied ($M \pm SE$).

There was also a significant TOOL x LEARNING OUTCOME interaction ($F(10.50, 1086.91)=6.40, p < 0.001$). Tests of simple effects showed that when each type of learning outcome is considered separately only knowledge and understanding ($p < 0.001$) and cognitive skills ($p=0.001$) show significant differences between tools. When each tool is considered separately, only quizzes ($p < 0.001$) and forums show significant differences between the different types of learning outcome ($p < 0.001$).

Employability skills

Ratings of the perceived helpfulness of each of the online tools in supporting different employability skills is shown in Figure 6.

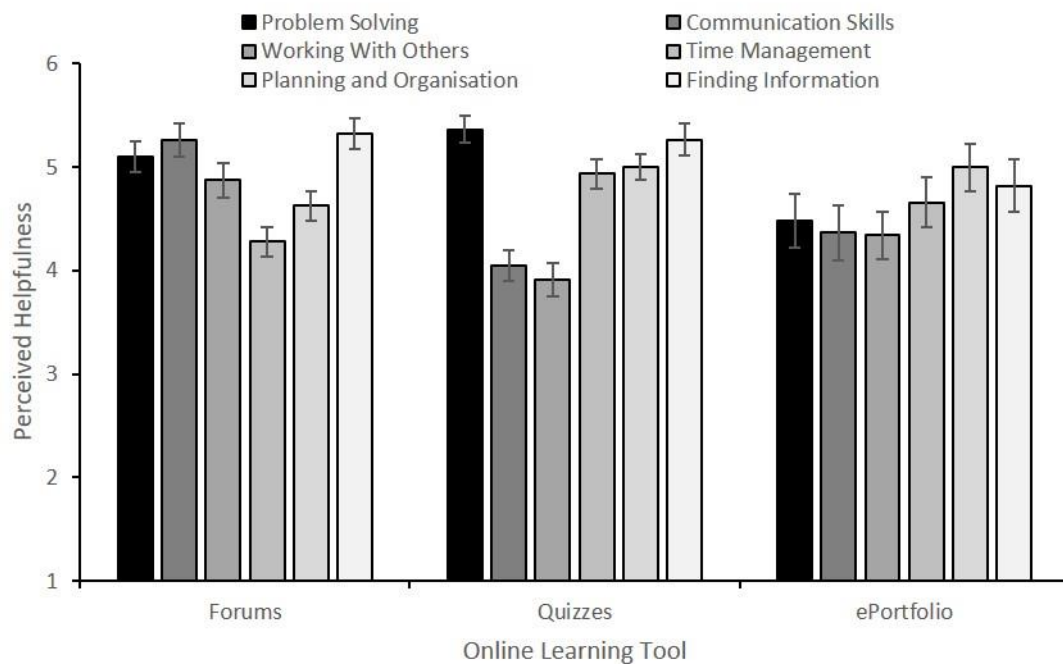


Figure 6 The ratings for the three tools' effectiveness in supporting different types of employability skill ($M \pm SE$).

A mixed- ANOVA with TOOL as the between measures effect and EMPLOYABILITY as the within-measures effect, found no significant effect of TOOL ($F(4, 370)=1.26, p=0.286$) but there was a significant main effect of EMPLOYABILITY ($F(3.63, 1342.34)=38.586, p < 0.001$). Repeated measures t-tests with a Bonferroni corrected alpha of 0.0038 found significant differences between all employability measures except problem solving and planning and organisation ($p=0.914$) and between communication skills and time management ($p=0.091$). The employability skill for which all tools collectively were considered the most helpful was Finding Information. By contrast, the least helpful was working with others (Figure 7).

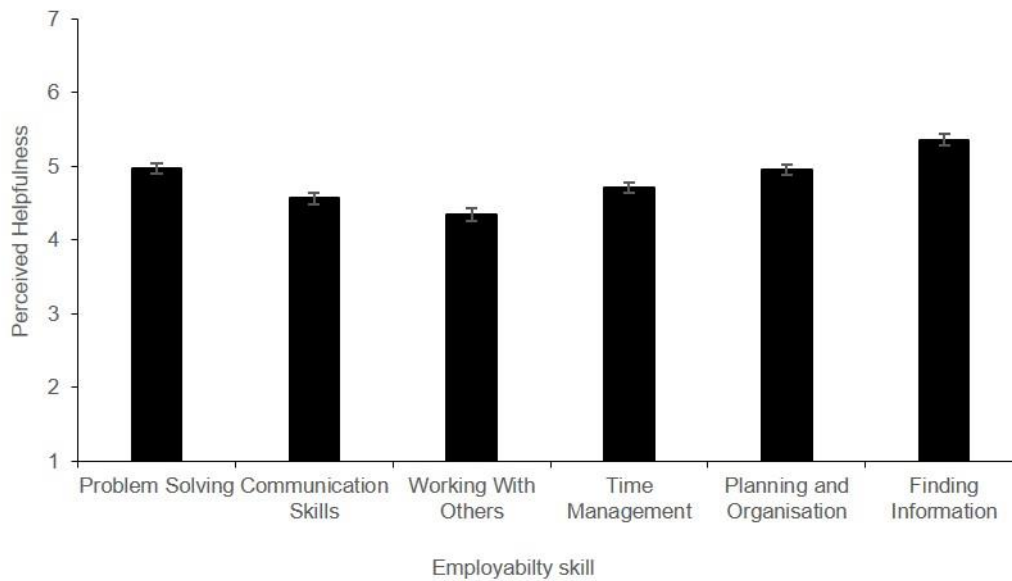


Figure 7 Across all tools there was variation in the helpfulness of the online tools in supporting development of specific employability skills ($M \pm SE$).

There was also a significant interaction effect ($F(14.52, 1342.34)=11.13, p < 0.001$). Tests of simple effects showed that when each individual employability is considered separately, all show differences between tools except Planning and Organisation. Similarly, when each tool is considered separately, all show differences between employability measures, although these are less significant for ePortfolios.

Predicting usefulness from employability and learning outcomes

For each tool, the ratings for all learning outcomes and employability skills were subjected to an exploratory factor analysis (direct oblimin rotation). For forums, this revealed two factors with eigenvalues above $\lambda=1$: Employability ($\lambda=4.856$; included all six employability measures) and Learning Outcomes ($\lambda=2.507$; included all learning outcome measures). Regression analysis revealed that these factors significantly predicted the helpfulness of forums ($F(2, 84)=11.85, p < 0.001, R^2=0.220$). However, only LOs were a significant predictor ($B=0.518, SE=0.13, \beta=0.418, p < 0.001$) with employability making no significant contribution ($B=0.116, SE=0.10, \beta=0.122, p=0.232$). For quizzes, factor analysis identified three factors with with

eigenvalues above $\lambda=1$: Learning Outcomes ($\lambda=3.736$; included all four learning outcome measures), Interpersonal Skills ($\lambda=1.909$; included working with others and communication skills from the employability measures) and Task Skills ($\lambda=1.419$; included the employability measure relating to tasks not people i.e. finding information, time management, planning and organization and problem-solving). Regression analysis revealed that these three factors significantly predicted the helpfulness of quizzes ($F(3, 83)=9.103, p < 0.001, R^2=0.248$). However, in this case LOs did not make a significant contribution ($B=0.185, SE=0.13, \beta=0.146, p=0.158$) but both variables relating to employability skills did (Task Skills $B=0.453, SE=0.11, \beta=0.417, p < 0.001$; Interpersonal Skills $B=-0.185, SE=0.08, \beta=-0.224, p=0.024$). It is noteworthy that the interpersonal skills was a negative predictor in this case. For ePortfolios, factor analysis revealed two factors with eigenvalues above $\lambda=1$: Employability ($\lambda=4.358$; included all six employability measures) and Learning Outcomes ($\lambda=2.591$; included all learning outcome measures). However, linear regression with these two factors, failed to significantly predict usefulness of ePortfolios ($F(2, 37)=1.776, p=0.183, R^2=0.088$).

3.3 Hypothesis 2: Ease of Use

Ease of use of different online tools

A One-Way ANOVA showed significant differences in the ease of use of the three tools, ($F(2, 243) = 7.40, p < 0.001$). Post-hoc Tukey tests revealed that there were significant differences between ePortfolios and both other tools (Figure 8) with the ePortfolio being perceived as harder to use.

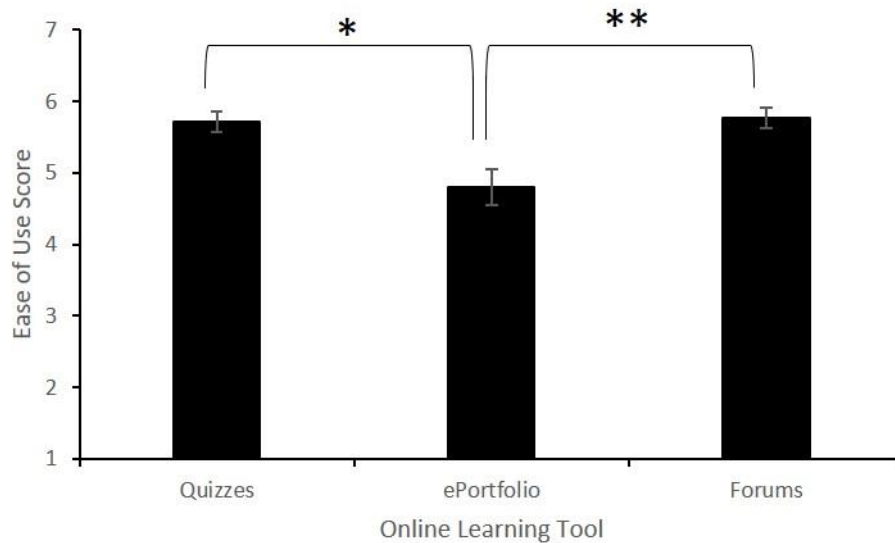


Figure 8 Differences in ease of use of online tools. * $p < 0.01$ ** $p = 0.001$ ($M \pm SE$).

Variations in ease of use with learner characteristics

This rating was considered in terms of learner characteristics for each tool to address the hypothesis. There were no differences between men and women for quizzes ($t(95)=1.64$, $p=0.105$), but there were differences for ePortfolios ($t(47)=2.33$, $p=0.024$) and forums ($t(95)=2.34$, $p=0.021$). In both cases men (ePortfolios $M=3.94$ $SE=0.46$, forums $M=5.19$ $SE=0.39$) found the tools harder to use than women (ePortfolios $M=5.15$ $SE=0.29$, forums $M=5.96$ $SE=0.14$). There were no differences between learners with and without English as a first language (forum $t(95)=0.65$, $p=0.521$; quizzes $t(95)=0.546$, $p=0.587$; ePortfolio $t(47)=0.836$, $p=0.407$), or level of study (forum $t(95)=0.846$, $p=0.400$; quizzes $t(95)=0.01$, $p=0.991$; ePortfolio $t(47)=0.836$, $p=0.407$). There were, however, some differences for disability. Disabled learners ($M=3.86$ $SE=0.77$) found use significantly harder in comparison to non-disabled learners ($M=5.87$ $SE=0.14$) for quizzes ($t(94)=3.64$, $p < 0.001$). There were no other significant differences (ePortfolios $t(46)=1.63$, $p=0.109$; forums $t(92)=1.02$, $p=0.310$). There were no significant correlations between ease of use of tools for all online tools and age or study hours (contact or independent). There were also no significant correlations with estimated performance for quizzes or portfolios. However, for forums, there was a significant

positive correlation indicating that those finding forums easier to use had higher estimated performance (Table 4). There were significant correlations between all tools indicating learners find the different tools of similar ease.

*Table 4 Correlations between ease of use and the age of the learner and their study hours and estimated performance * $p < 0.05$, ** $p < 0.001$.*

	1	2	3	4	5	6
1. Quizzes	-					
2. ePortfolio	0.532**	-				
3. Forums	0.769**	0.545**	-			
4. Age	-0.074	-0.076	-0.109	-		
5. Contact hours	-0.004	-0.066	-0.007	-0.207**	-	
6. Independent study hours	-0.064	0.005	0.001	0.119	-0.07	-
7. Performance	0.148	0.073	0.220*	-0.126	-0.169*	0.148

Hypothesis 3: Predicting frequency of use

It was hypothesized that frequency of use would be predicted by ease of use and helpfulness of the different tools. For each tool, linear regression with these two variables as predictors of frequency of use showed a significant proportion of the variance in frequency of use was explained (forums $F(2, 91)=15.10$, $p < 0.001$, $R^2=0.249$; quizzes $F(2, 91)=7.45$, $p=0.001$, $R^2=0.141$; ePortfolios $F(2, 45)=5.27$, $p=0.009$, $R^2=0.190$). However, for both forums and quizzes the only significant predictor was helpfulness (forums $B=0.462$, $SE=0.087$, $\beta=0.492$, $p < 0.001$; quizzes $B=0.375$, $SE=0.10$, $\beta=0.386$, $p < 0.001$) with ease of use making no significant contribution (forums $B=0.024$, $SE=0.078$, $\beta=0.030$, $p=0.749$; quizzes $B=-0.036$, $SE=0.08$, $\beta=-0.048$, $p=0.640$). For ePortfolios, neither variable reached significance, but ease of use showed a trend to significance ($B=0.223$, $SE=0.11$, $\beta=0.294$, $p=0.056$) unlike helpfulness ($B=0.224$, $SE=0.16$, $\beta=0.216$, $p=0.155$).

Discussion

Hypothesis testing

The first hypothesis stated that the perceived usefulness of an online learning tool would vary with learner characteristics, perceived quality of the online experiences and how effective the user feels these tools are in supporting specific learning outcomes and employability skills. This hypothesis was partially supported. For forums, it was found that overall helpfulness of the tool did differ according whether the learners have English as a first language and their overall perceptions of quality of online learning experience, but not face-to-face. Helpfulness of quizzes differed according to whether the learner had a disability or not and their perceptions of online learning experiences. There were no differences or relationships between learner characteristics and helpfulness ratings for ePortfolios. These results are partially in line with previous research which has identified that some online tools can represent specific challenges for disabled students (Crow, 2008) and that engagement can relate to quality (Chang and Tung, 2008). However, there was no significant relationship between gender and helpfulness, as might be expected based on previous research (Arbaugh et al., 2008; Chmielewski, 1998; Jackson et al., 2001). Similarly, there was no impact of age as has been found before, but the age range in the present study was quite narrow which may mask any effect (Hoskins & Van Hooff, 2005).

In terms of employability and learning outcomes, the role of these in influencing overall perceptions of helpfulness varied by tool. For forums only LOs were influential, whilst for quizzes, the reverse was true with employability skills showing predictive power for helpfulness. Finally, neither were significant predictors of ePortfolio helpfulness. The lack of effect of learning outcomes on helpfulness for quizzes and ePortfolios is surprising given previous research (Carmean & Christie, 2006; Gold, 2001; Granberg, 2010), however, the descriptive data showed that students did not generally see any of the tools as very good at

supporting learning outcomes. Furthermore, the typical use of quizzes in the institution where the research was conducted is for formative self-assessment purposes and this may have impacted on the relationship with learning outcomes. Certainly, previous research has shown that students generally show sustained engagement with a tool when required for summative assessment purposes (Thomas, 2002). The same may be true of ePortfolios because whilst these may be used for assessment purposes, they are more commonly used as process or showcase ePortfolios in the institution (Smith & Tillema, 1998). Whilst the link between assessment and specified learning outcomes should be clear, it is possible that it is not and so a student can perceive a tool as useful because of its relationship to assessment but not specific classes of learning outcomes. Employability skills were generally better supported by the online tools than learning outcomes and employability significantly predicted engagement with quizzes, specifically the task related employability skills such as problem solving and planning. The lack of effect of employability on ePortfolio perceptions of helpfulness is a little surprising given this tool tends to be used by programmes of study to collate examples of achievement and reflect (Garrett & Jackson, 2006; Jun, Anthony, Achrazoglou, & Coghill-Behrends, 2007) but this may reflect the general lack of use and awareness of ePortfolios in the current study with only 27% using them.

Additional to these central analyses, no differences were found between online tools in terms of helpfulness, but generally found men rated their learning experiences as poorer and that overall, face-to-face learning experience quality was correlated with performance, whilst online learning quality was not. Whilst the tools did not differ in their ability to support learning outcomes, they were generally all considered better at supporting knowledge and understanding and cognitive or key skills rather than professional and practice skills. Similarly, all tools supported employability skills in a similar way with Finding Information the best supported skill. These findings indicate that learners are not differentiating between tools,

possibly because they do provide genuinely comparable uses. However, this in itself is surprising given that some tools, for example forums are much more suited to social engagement and social learning than quizzes. However, research suggests that forums may not always be optimally used with a recent meta-analysis reviewing 18 studies showing that students' knowledge construction within forum indicated a low level of cognitive engagement (Martono & Salam, 2017). Therefore, even if a tool can be used in a particular way, learners may not use it in this manner.

For our second hypothesis, it was suggested that ease of use of online tools would be affected by learning characteristics. This hypothesis was supported to some extent. For example, the ease of use of quizzes differed according to disability whilst both ePortfolios and forums were deemed harder to use by men. Interestingly, higher performing students found forums easier to use. This is noteworthy because overall quality of online learning experiences did not relate to performance. In addition to these main analyses, ePortfolios were found to be harder to use than forums or quizzes. These findings partly align to existing literature. For example, research has shown that men find it harder than women to interact in some online classes (Arbaugh et al., 2008) and are less inclined to join online discussions (Jackson et al., 2001). However, previously it was noted that men had more knowledge of the web and were using it more often (Chmielewski, 1998), which seems at odds with them finding it harder to use. In the present study, participants were asked to rate ease of use and not to differentiate between their technical abilities and other factors that could influence ease of use, like comfort in engaging with others in a forum setting. The finding that those reporting forums as easier to use are generally higher performing is also in line with previous research (Hoskins & Van Hooff, 2005). Given forums were most highly rated of all technology for finding information and supported knowledge and understanding, it is possible to speculate that the assessment used relies heavily on these skills.

Such as speculation, of course is tentative because, the learners in the current study were spread across the entire university so assessment would likely vary considerably.

For our final hypothesis, it was suggested that overall usefulness, as measured by our helpfulness question, and ease of use would predict frequency of use. Again, this hypothesis was partially supported. Helpfulness was a significant predictor for quizzes and forum use but not ePortfolios and ease of use did not predict frequency of use for any tool. However, it is noteworthy that overall frequency of use was not that high. The fact that ease of use did not predict frequency of use is at odds with the proposal by Davies (Davis, 1989). However, there are several reasons why this could be the case. Firstly, in the current study, most tools were deemed relatively easy to use, suggesting a lack of spread in the data impacting on the results. Secondly, the sample size for this analysis was relatively small which may mask effects.

Limitations

There are several limitations to the present study which should be acknowledged. Firstly, all measures were self-report measures and therefore may not be accurate. However, given the learners were able to respond to the survey anonymously and the general profile of learners including their performance, which could be deemed the most sensitive information, matches the formal records held by HESA for the institution, it seems likely that the information gathered is accurate. Secondly, this study did not consider different purposes for which the tools may be used by both the students and the intended use by staff. For example, in some courses, quizzes may be used for formal assessment whilst in others they are purely for self-assessment and optional. These different purposes may have impacted on the measures collected. Future work should consider asking learners to explain how they use the tools and whether these uses are self-directed or part of their directed study. Secondly, in this study it was assumed that all learners would have experience of all categories of learning outcomes and employability skills, which may not be the case. In future, it may be helpful to collect data on

the relative use of different learning objectives and employability skills from learners. Thirdly, data was only collected from learners and it may be helpful to understand better how practitioners aim to use the tools in their teaching. For example, if a tool is clearly designed to be used for one purpose and little flexibility is given it is plausible learners will not be familiar with the ability of tools to achieve other purposes. Finally, the main limitation of our study is the low sample size, which was particularly problematic for ePortfolios. Only around 60% of learners had used forums and quizzes and even fewer had used ePortfolios. Any future survey should either allow for more respondents or target specific groups known to use the tools.

Implications for practitioners

There are several points from the current study that are of direct relevance to practitioners. Firstly, the current study provides further evidence that learner characteristics can impact on how online tools are used. For example, disability and English language status impact on how useful a tool is deemed and this in turn can impact on frequency of use. However, critically, the characteristics that impact vary between tools and therefore, careful consideration should be given to the tools used based on the individual cohorts. As an illustration where programmes have considerable numbers of international learners for whom English may not be a first language the use of forums may be particularly helpful to learners. Secondly, learners did not generally believe the online tools tested here were effective at supporting development of learning outcomes. This may be in part because the role of the tools in achieving these is not being explicitly articulated and therefore this should be considered. Thirdly, ease of use varied by gender with men, who are generally thought to spend more time online and know more about it, finding the tools harder to use. Interestingly, they also rated both online and face-to-face learning experiences as poorer than their female counterparts. This suggests that some consideration should be given to how these tools are used, for example, whether additional

training may be needed and whether, improved ease would improve overall quality of learning experiences.

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